Survey of Allergy in Bangalore Due to Parthenium

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Final Technical Report
on the
KSCST Sponsored Project

COMMUNITY [illegible]

SURVEY OF ALLERGY IN BANGALORE DUE TO PARTHENIUM

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Date of commencement : 19.11.1984
Ended on : 31.3.1986

Amount Sanctioned: Rs.20,000/-

This report includes clinical studies carried out on othe prevalence of Parthenium rhinitis in Bangalore. I wish to thank the KSCST, Bangalore for extending partial financial support for this project. The major support was received from the Department of Environment, Govt. of India.

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CLINICAL STUDIES ON THE PREVALENCE OF PARTHENIUM RHINITIS

INTRODUCTION

The Compositae weed, Parthenium hysterophorus (American feverfew) which is related to Ambrosia (ragweed) is a native of Argentina, Mexico, West Indies and Southern parts of U.S.A. It was presumed to have been accidentally introduced into India around 1956 along with the imported wheat grains and more recently to Queensland, Australia (Towers et al., 1977). After its initial appearance in Poona city, the weed very soon got adapted to the Indian soil and climate and within two decades it had spread extensively in many parts of India. There is no vacant land in and around the city of Bangalore (South India) which is free from Parthenium weed. Like ragweed of the American mid west, Parthenium was found to cause allergic contact dermatitis affecting the exposed skin surface of adult subjects (Prakash et al., 1978; Subba Rao et al., 1977 and Lonkar et al., 1974). A daily survey of the atmospheric pollen in Bangalore conducted during January-December, 1979 revealed that Parthenium pollen was wind borne in highly significant amounts either as individual pollen grains or in the form of clumps (consisting of 2-80 grains) (Mangala et al., 1981) and was responsible for allergic rhinitis (Rao, et al., 1985). Although the clinical and immunological studies established that Parthenium pollen is a potent atopic allergen, the percentage of the population sensitized to this pollen is not known. The present study was therefore undertaken to determine the incidence of Parthenium rhinitis in a random Bangalore population as well as in patients suffering from nasobronchial allergy, by skin prick test and

quantitation of Parthenium pollen-specific IgE antibodies by avidin biotin-microELISA.

MATERIALS AND METHODS

Materials

Tween-20, heparin and bovine serum albumin (BSA) (Sigma Chemical Co., St. Louis, MO), o-phenylenediamine (Aldrich Chemical Co., Milwaukee, WI), hydrogen peroxide (3%, v/v) (Glaxo Laboratories India Ltd, Bombay), CNBr-activated Sepharose 4B, Ficol paque (Pharmacia Fine Chemicals, Uppsala), biotin-N-hydroxysuccinimide ester (Vega Biochemicals, Tuscon, AZ), horseradish peroxidase-avidin conjugate (Vector Laboratories, Burlingame, CA), RPMI-1640 medium with L-glutamine, foetal calf serum (Gibco laboratories, Great Island, NY), ^{3}H-thymidine (Bhaba Atomic Research Centre, Bombay) and polystyrene microtiter plates (96 well flat-bottom) with lids (Costar, Cambridge, MD), were obtained from the manufacturers. Mite (Dermatophagoides farinae) extract (1:10 w/v) was obtained from Walter Reed Army Medical Center, Allergy Extract Laboratory, Washington, D.C., while skin prick test extracts of Amaranthus, Carica papaya, castor bean, Chenopodium, Aspergillus, Alternaria, Cladosporium and grass pollen (1:10 w/v) were purchased from Curewel, Faridabad, India. All other chemicals were of analytical grade and available commercially.

Collection of Parthenium pollen

The stalks of freshly cut and washed inflorescences of Parthenium were immersed in water and kept in a dust free room

till anthers dehised. The shed pollen was collected after seiving through a 250 microns mesh, defatted by washing repeatedly with chilled peroxide-free ether and dried in vacuum. The dehydrated pollen with 98% purity (microscopic examination) was stored in a dessicator at -20°C until further use.

Preparation of Parthenium allergen extract for skin test

Defatted Parthenium pollen was extracted with PBS, pH 7.4 for 20 hr at 4°C (1:10 w/v). The extract was then filtered, centrifuged at 20,000g for 20 min and diluted with equal volumes of glycerol after passing through a sterile millipore filter (0.45u). The resultant allergen extract (1:20 w/v) was stored at 4°C and used for skin test.

Skin test procedure

Skin prick tests were performed with allergen extracts on the volar surface of the forearm of patients suffering from seasonal or perennial rhinitis as well as control subjects according to the procedure described by Pepys et al., (1975). A 50% glycerine solution in PBS (pH 7.4) and histamine hydrochloride (1mg/ml) dissolved in PBS-glycerol (1:1 v/v) served as negative and positive controls, respectively. The size of the wheal reaction after 15 min was determined by measuring the diameter in two perpendicular directions and then halving the sum. The reaction was designated as positive, if the net wheal diameter was greater than 3 mm over the negative control.

Patients

During the 'open days' at the Indian Institute of Science

in connection with the Platinum Jubilee year (March 3-5, 1985), general public visited various departments. This opportunity was utilized to conduct a random survey of the urban population to determine the incidence of nasobronchial allergy as well as sensitivity to Parthenium pollen and house dust mite, two dominant airborne allergens in Bangalore. A booth was set up in the department where 2035 out of over 10,000 visitors of either sex in the age group of 3 to 65 years (1308 males and 727 females), randomly participated in the survey. After obtaining a brief clinical history on a printed proforma, they were subjected to prick skin test to determine their sensitivity to Parthenium pollen and house dust mite. The skin reactions were read and recorded at the exit point, where the subjects reached in about 20 min.

In addition to the subjects who participated in the random survey, 1252 patients of either sex in the age group of 15-65 suffering from allergic rhinitis or bronchial asthma who visited the allergy clinic associated with our Laboratory were also included in the study. Healthy humans of the same age group with no history of atopy (rhinitis, asthma or atopic dermatitis) served as normal controls. Sera collected from allergic patients and normal volunteers were stored at $-90^{o}C$ until use.

Antibodies

Monospecific goat anti-human IgE (-chain specific) and IgG (-chain specific) antibodies purchased from Meloy laboratories (Springfield, Va), were further purified by affinity chromatography using human IgE and IgG conjugated to CNBr-

activated Sepharose-4B respectively (Subba Rao et al., 1983). Biotinylation of the affinity purified goat anti-human IgE and IgG was performed as described earlier (Subba Rao et al., 1983).

Quantitation of Parthenium pollen allergen-specific IgE and IgG antibodies by Avidin-Biotin microELISA (AB-microELISA)

The procedure described by Subba Rao et al., (1983) was used with minor modifications. Polystyrene microtiter plate wells were coated with 100ul of Parthenium pollen extract (5ug/ml) in 0.1M sodium carbonate-bicarbonate buffer, pH 9.6 at 37°C for 1 hr. After washing with rinse buffer (0.05% Tween-20 in PBS pH 7.4), the unoccupied sites were blocked with 100 ul of 2% goat serum in rinse buffer (serum diluent buffer) for 1 hr at 37°C. The wells were then washed 5 times with rinse buffer and incubated with 100ul of patient's serum (diluted 1:10 and 1:100 in serum diluent buffer for the detection of Parthenium-specific IgE and IgG respectively), for 1 hr at 37°C. Wells containing serum diluent buffer without serum served as the reagent blank. After washing, biotin conjugated to goat anti-human IgE or IgG (1 mg/ml solution diluted 1:1000 and 1:2000 respectively, with serum diluent buffer) was added to each well and incubated for 30 min at 37°C. Wells were washed and incubated with 100 ul of horseradish peroxidase-avidin conjugate (8.2 mg/ml) in 0.1 M sodium bicarbonate, pH 8.5 (diluted in 1:2000 in serum diluent buffer), at 37°C for 5 min. After the incubation period, the wells were washed and 100 ul of substrate solution (0.5 mg/ml o-phenylenediamine and 0.006% of H_2O_2 in 0.1 M phosphate buffer, pH 7.0) was added to each well. The plate was incubated at room

temperature in dark for 20 min. The reaction was terminated by the addition of 100 ul of 2 N HCl and colour developed was read at 492 nm. The mean binding of Parthenium-specific IgE and IgG is expressed as ELISA units/ml undiluted serum where one ELISA unit is defined as the absorbance value of 1.0 at 492 nm. In the microELISA inhibition assay, serum from the patient was diluted appropriately and preincubated for 1 hr at 37°C with increasing concentrations of Parthenium pollen extracts (0.0001 to 10 ug/ml) before adding the mixture to antigen coated wells. Subsequent steps of the assay were the same as those described for AB-microELISA procedure.

Lymphocyte transformation test

Heparinized blood was obtained from 6 normal controls and 2 rhinitis patients with positive prick skin reaction to Parthenium pollen and elevated levels of Parthenium-specific serum IgE. Peripheral blood mononuclear cells (PBMC) were separated from venous blood (diluted with equal volume of PBS) by Ficol paque density gradient centrifugation. The cells were washed thrice with PBS and resuspended in RPMI-1640 tissue culture medium supplemented with HEPES (25mM), L-glutamine (1%), penicillin (100 U/ml) streptomycin (100 ug/ml) and heat inactivated foetal calf serum (10%).

Cultures in duplicate containing 200 ul of $5X10^6$ PBMC were added to sterile round bottom microtiter wells and incubated with Parthenium pollen extract (0-128 ug/ml) for 6 days in a humidified atmosphere of 5% CO_2 at 37°C. Cultures with PBMC from normal patients served as controls. The cells were harvested onto

glass fiber discs using a semiautomated harvester (PHD cell harvester, Cambridge, MA, USA) 16 hr after the addition of 0.5 uCi ^{3}H-thymidine (sp. activity 6.6 Ci/mmole). The radioactivity was measured using toluene based scintillation fluid. The response of the cultured cells expressed as stimulation index (SI) was obtained by dividing the radioactivity of the stimulated cell cultures with that of the non-stimulated cell cultures.

Statistical Analysis

The significance of difference in distribution and linear correlation of coefficient was calculated as described by Snedecor and Cochran, (1968).

RESULTS

Random Clinical Survey

A random clinical survey was conducted on 2035 residents from Bangalore to evaluate the incidence of nasobronchial allergy as well as their sensitivity to Parthenium pollen. Persons who volunteered to participate in the survey included school children, college students, house wives, persons employed in various jobs and retired personnel and were in the age group of 3-65 years. The study population was from different residential areas of Bangalore and represented different economic groups. Table 1 shows the incidence of rhinitis or asthma in the study group. Thirty six percent of the randomly selected persons were females. Among the survey group, 2.95% gave clinical history suggestive of bronchial asthma while 19.2% complained of nasal problems, mostly rhinitis, characterized by sneezing,

watery eyes, running and or blocked nose. The percentage of subjects suffering from the latter symptoms (males 19.8% and females 18.2%) was far higher than the percentage of individuals who complained of asthma (males 2.9%, females 3.0%).

Table 1

Random survey on the incidence of rhinitis or asthma in Bangalore population

Sex	No. of persons	Rhinitis* (%)	Asthma** (%)
Male	1308	19.8	2.9
Female	727	18.2	3.0
Both	2035	19.2	2.95

* Sneezing, watery eyes, running and/or blocked nose in the absence of cold.

**Chest tightness and prolonged wheezing

Prick skin tests were performed on the survey group to determine their sensitivity to Parthenium pollen and house dust mite. From Table 2 it is apparent that 9.6% of the total population (n=2035) were sensitive to Parthenium pollen alone while 4.3% were sensitive to house dust mite and an additional 1.6% to both Parthenium and house dust mite. Further, among the total random polulation, 7.1% and 2.6% of the persons suffering from rhinitis were sensitive respectively to Parthenium pollen and house dust mite, and an additional 1.3% were sensitive to both the allergens. While only 0.4% of the study group suffering from bronchial asthma were sensitive to Parthenium pollen, 0.8

and 0.1% of the patients suffering from asthma were sensitive respectively, to house dust mite or both the allergens. In addition, 1.8% and 0.8% of the asymptomatic subjects also elicited positive skin reaction to Parthenium pollen and house dust mite, respectively.

Table 2

Sensitivity of a random population of Bangalore to Parthenium pollen and house dust mite

Study group	Percentage of individuals (n = 2035) with positive skin reaction to		
	Parthenium pollen	House dust mite	Both
Total	9.6	4.3	1.6
Rhinitis	7.1	2.6	1.3
Asthma	0.4	0.8	0.1
Asymptomatic	1.8	0.8	0.2

Among the total rhinitis patients (n=391), 26.1% were sensitive to Parthenium pollen alone, while 9.5% and 4.9% were sensitive respectively to house dust mite or both the allergens, respectively (Table 3). However, 13.3% of the asthmatics (n=60) gave a positive skin reaction to Parthenium pollen, while 28.3% were sensitive to house dust mite and 3.3% to both the allergens.

Clinical studies on patients with nasobronchial allergy

Skin tests were performed also on 1294 subjects suffering from nasobronchial allergy (810 rhinitis patients and 484

asthmatics) who visited the allergy clinic associated with our Laboratory between 1985-1988 to assess their sensitivity to *Parthenium* pollen. The results are summarized in Table 4.

Table 3

Sensitivity of patients with nasobronchial allergy to *Parthenium* pollen and house dust mite

Study group	No. of patients	Percentage of patients suffering from nasobronchial allergy with positive skin to		
		Parthenium pollen	House dust mite	Both
Rhinitis	391	26.1	9.5	4.9
Asthma	60	13.3	28.3	3.3

Table 4

Incidence of *Parthenium* sensitivity among patients with nasobronchial allergy

Year	No. of patients	Patients sensitive to *Parthenium* pollen (%)*		
		Total	Male	Female
1985	315	35.7	35.2	37.0
1986	259	43.8	50.0	31.9
1987	362	45.7	49.7	40.3
1988	358	45.6	49.0	37.5
n = 1294		42.5±3.9	46.0±6.2	36.7±3.0

*The figures represent the percentage of patients sensitive to *Parthenium* pollen alone or in association with other allergens as determined by positive prick skin reaction to *Parthenium* pollen (1:20) and other allergen extracts (1:10 w/v).

From the data, it is apparent that 42.5% of the total patients with nasobronchial allergy elicited positive skin reaction to Parthenium pollen either exclusively or in addition to other allergens.

Prick skin tests performed on 810 rhinitis patients revealed that 37.9% of the total subjects were strikingly sensitive exclusively to Parthenium pollen (Table 5).

Table 5

Results of skin prick test reaction of rhinitis patients to Parthenium and other common airborne allergens

Allergen(s)	Percentage of patients showing positive reaction*
Parthenium pollen	37.9
Parthenium pollen + House dust mite	12.5
Parthenium pollen + allergens other than house dust mite**	2.7
House dust mite	11.9
Allergens other than Parthenium and house dust mite	2.3

* n = 810

**Pollen of Amarantus, Carica papaya, Chenopodium and grass; castor bean, aspergillus, alternaria & cladosporium (1:10,w/v).

A wheal greater than 3 mm in diameter above the negative saline control was taken as a positive reaction. For details see Materials and Methods.

An additional 12.5% were sensitive not only to Parthenium pollen

but also to house dust mite and 2.7% to other air borne allergens. In comparison, however, only 11.9% of the total rhinitis patients elicited positive skin reaction to house dust mite alone and 2.3% to allergens other than Parthenium pollen and house dust mite (Amaranthus, Carica papaya, Chenopodium, grass pollen, castor bean, Aspergillus, Alternaria and Cladosporium).

Seasonal variation in the concentration of air borne Parthenium pollen and incidence of allergic rhinitis

Parthenium pollen is wind borne and in areas heavily infested with the weed (e.g. Bangalore), 48% of the pollen in the atmosphere during the months of June-September is derived from Parthenium (Mangala et al., 1981). A correlation between the concentration of Parthenium pollen in Bangalore atmosphere and incidence of allergic rhinitis in patients reported at our clinic with skin test proven sensitivity to Parthenium pollen during different months of 1987 is shown in Fig. 1. The incidence of allergic rhinitis attributable to Parthenium pollen was also high during the monsoon months, (June-October) with a maximum in July and August, and 71.6% of the total rhinitis patients were sensitive to Parthenium pollen alone or in association with other allergens.

Allergen-specific antibodies

Parthenium pollen-specific IgE and IgG antibodies were demonstrable in the sera of Parthenium sensitive patients by AB-microELISA (Fig. 2). While 61% of the patients with positive skin reaction to Parthenium pollen extract had varying amounts of allergen-specific IgE, 65.8% had elevated levels of specific IgG

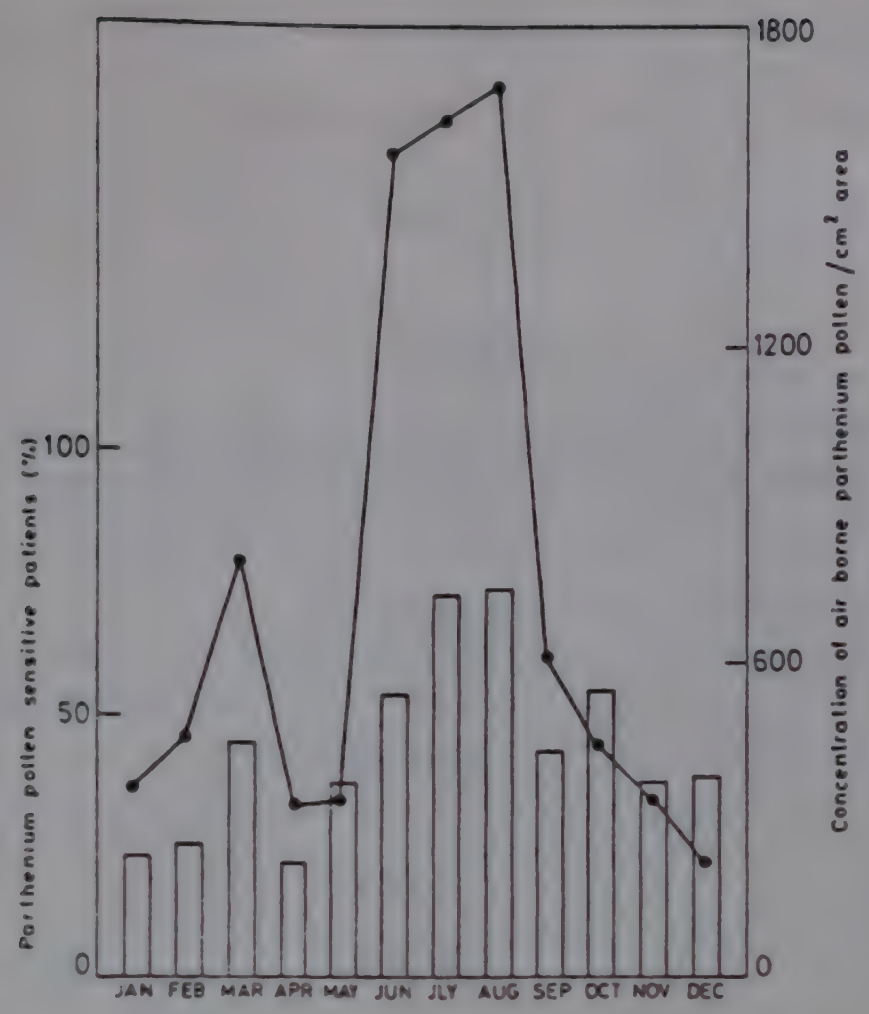

Fig 1. SEASONAL VARIATION IN THE CONCENTRATION OF AIR BORNE PARTHENIUM POLLEN AND THE INCIDENCE OF PARTHENIUM RHINITIS

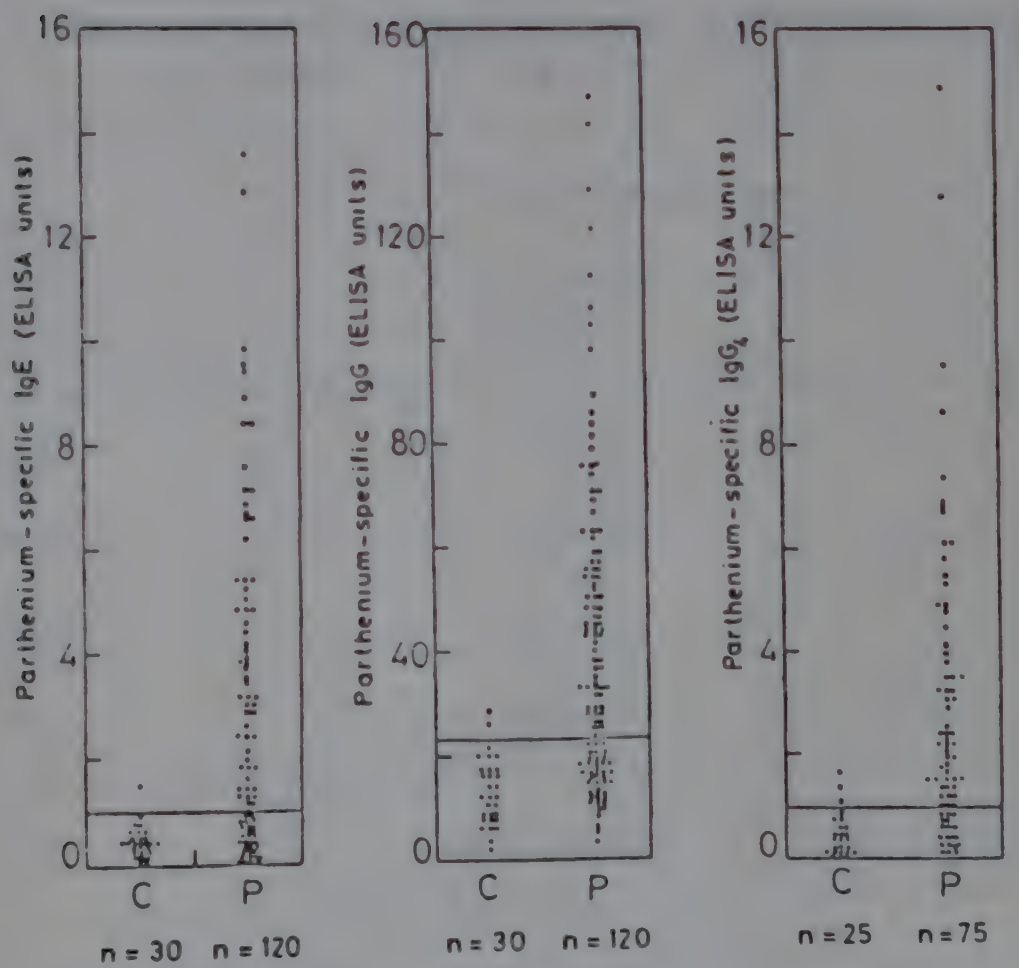

Fig 2. LEVELS OF PARTHENIUM POLLEN-SPECIFIC ANTIBODIES IN THE SERA OF PARTHENIUM SENSITIVE RHINITIS PATIENTS (P) AND NORMAL SUBJECTS (C).

asthmatics) who visited the allergy clinic associated with our Laboratory between 1985-1988 to assess their sensitivity to *Parthenium* pollen. The results are summarized in Table 4.

Table 3

Sensitivity of patients with nasobronchial allergy to *Parthenium* pollen and house dust mite

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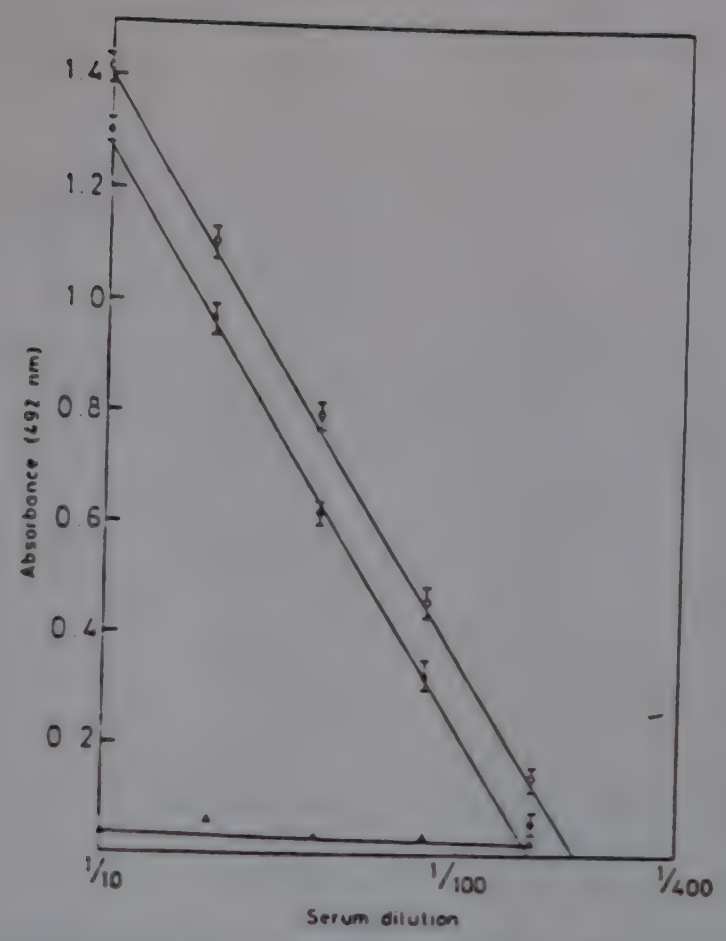


Fig 3. SERUM DILUTION CURVES FOR PARTHENIUM POLLEN-SPECIFIC IgE IN THE SERA OF PARTHENIUM SENSITIVE RHINITIS PATIENTS BY AB-MICRO ELISA (●, ▪ - PATIENTS; ▲ - CONTROL)

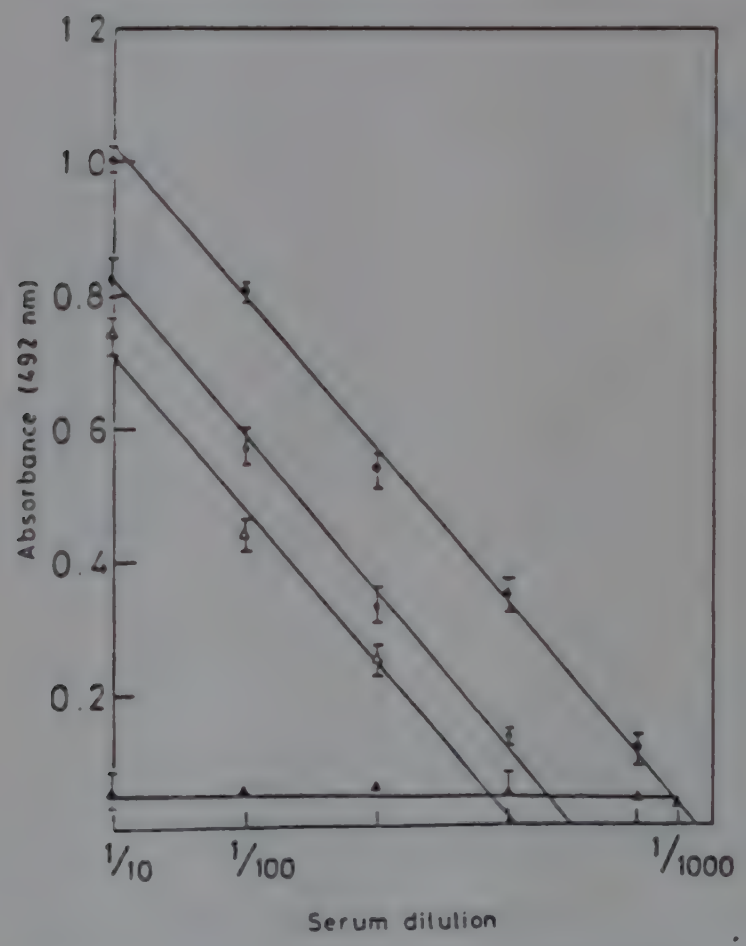
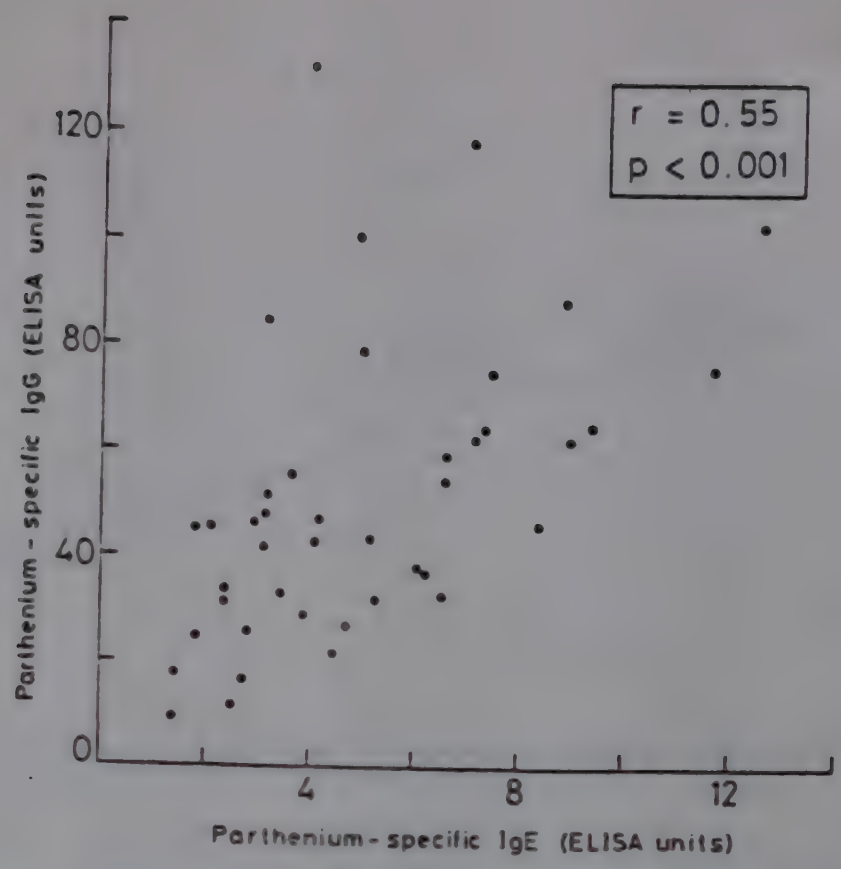
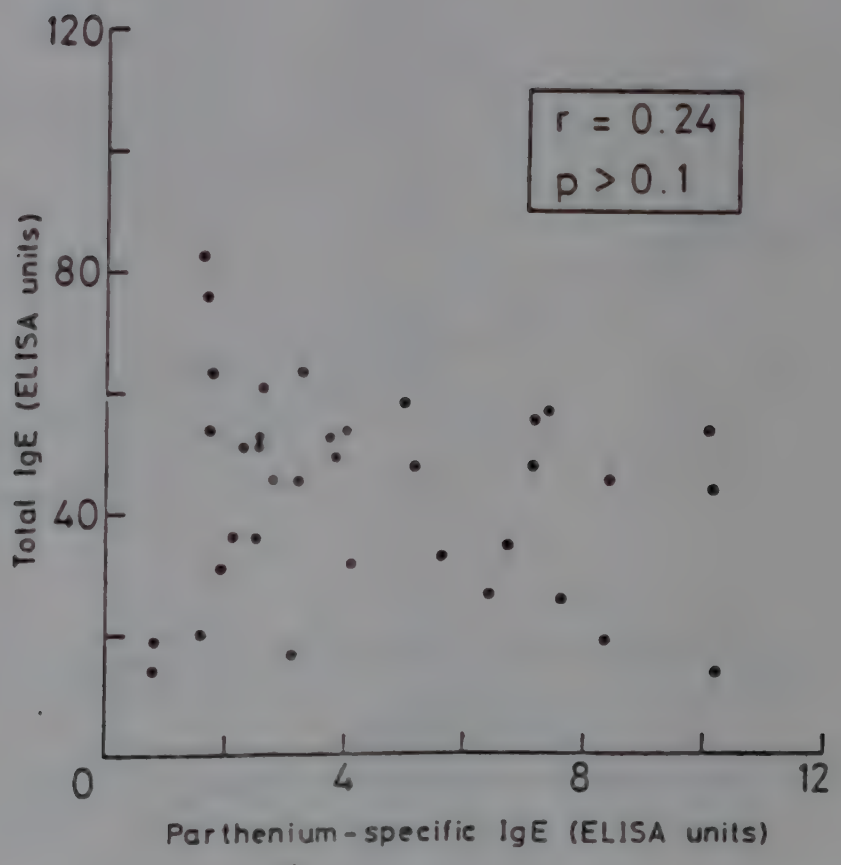


Fig 4. SERUM DILUTION CURVES FOR PARTHENIUM POLLEN-SPECIFIC IgG IN THE SERA OF PARTHENIUM SENSITIVE RHINITIS PATIENTS BY AB-MICRO ELISA (●, ▪, △ - PATIENTS; ▲ - CONTROL)



7.95. CORRELATION BETWEEN PARTHENIUM - SPECIFIC IgE AND IgG IN THE SERA OF PARTHENIUM SENSITIVE RHINITIS PATIENTS.



7.96. CORRELATION BETWEEN TOTAL IgE AND PARTHENIUM POLLEN - SPECIFIC IgE IN THE SERA OF PARTHENIUM SENSITIVE RHINITIS PATIENTS.

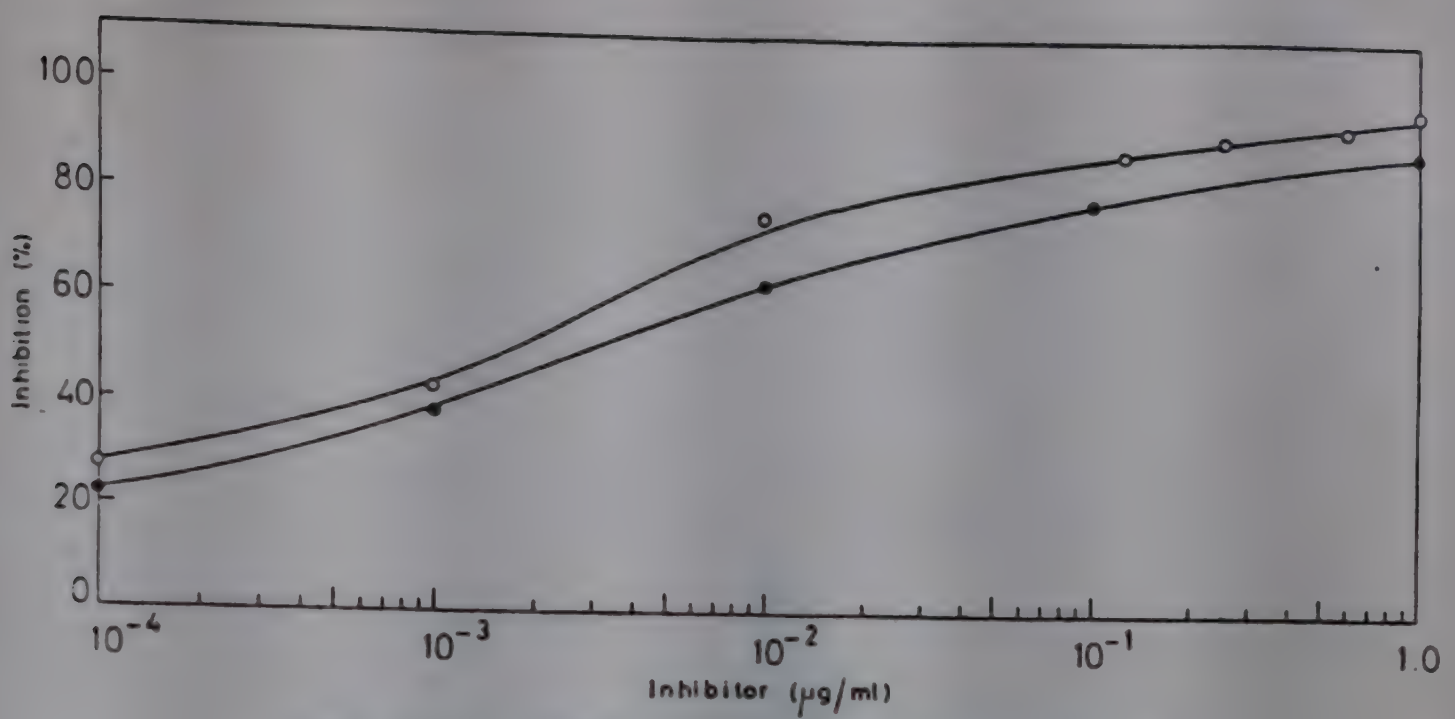


Fig 7. ELISA INHIBITION CURVES FOR PARTHENIUM-SPECIFIC IgE

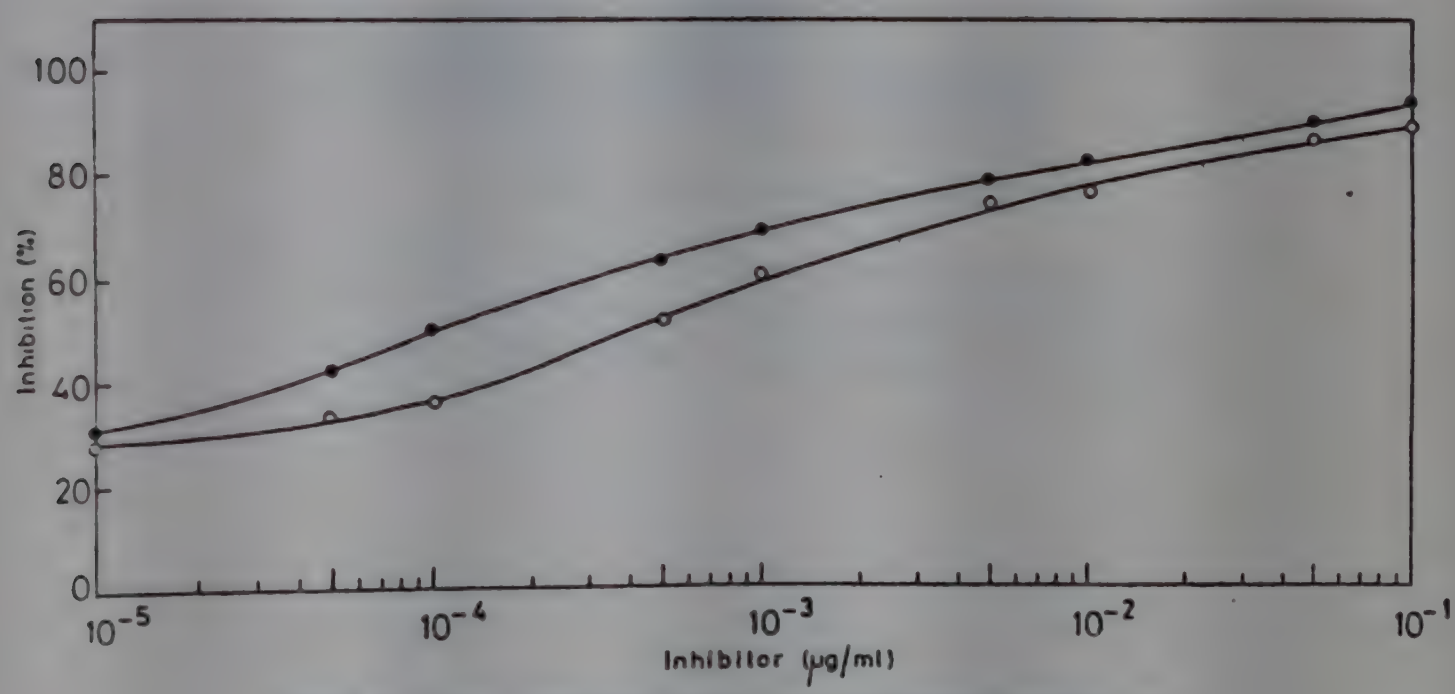


Fig 8. ELISA INHIBITION CURVES FOR PARTHENIUM-SPECIFIC IgG.

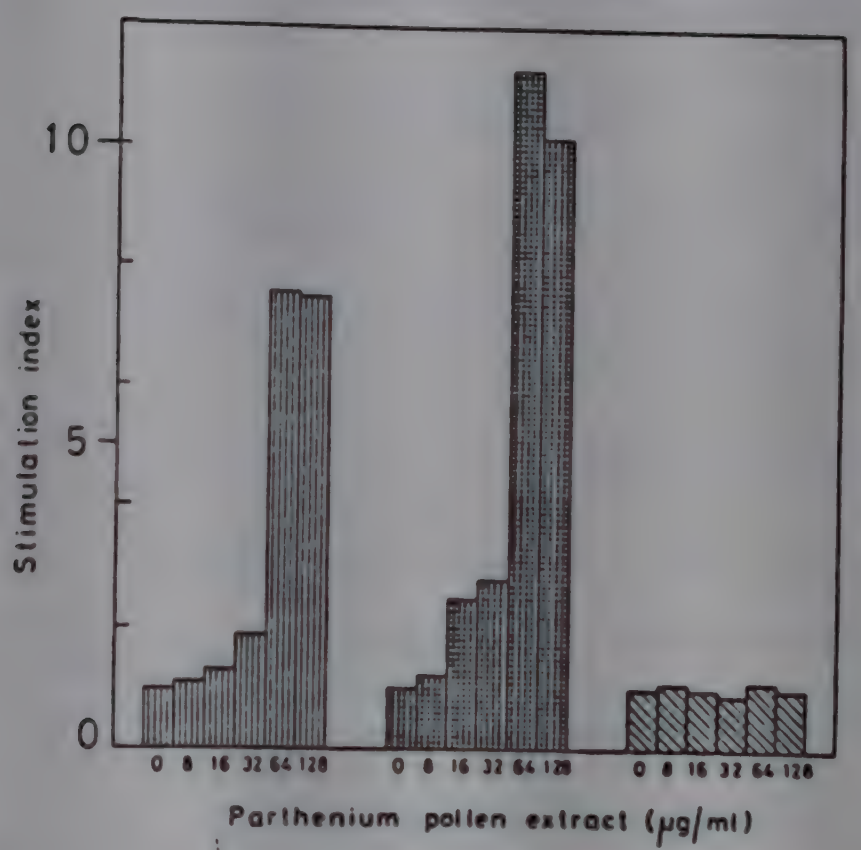


Fig 9. PARTHENIUM POLLEN ALLERGEN INDUCED PROLIFERATION OF LYMPHOCYTES FROM PARTHENIUM SENSITIVE RHINITIS PATIENTS. PATIENT 1 ; PATIENT 2 ; CONTROL.

test. Peripheral blood mononuclear cells of two patients (with positive skin reaction and elevated levels of Parthenium-sensitive serum IgE) and three control subjects were incubated with increasing concentrations of Parthenium pollen extract (0-128 ug/ml). A dose dependent lymphocyte response was obtained with a maximum proliferation between a concentration of 64-128 ug/ml. The stimulation index of cell cultures of normal subjects (n=3) incubated with increasing concentrations of the allergen extract however, remained equal or less than 1 (Fig. 9).

DISCUSSION

Pollen of Parthenium is wind borne either singly or in clumps and in areas heavily infested with the weed (e.g. Bangalore city), 48% of the pollen in the atmosphere during the months of June-September is derived from Parthenium (Mangala et al., 1981). A steady increase in the incidence of allergic rhinitis was noticed in Bangalore during the past decade which corresponded with the increased spread of the weed. Previous studies performed on 143 patients revealed that 34% suffering from rhinitis and 12% from bronchial asthma gave positive skin reaction to Parthenium pollen antigen extracts (Rao et al., 1985). Positve skin test reaction to Parthenium pollen was also reported for rhinitis patients from Brisbane, Australia where the weed is growing wild (Dr. J.A. Stewart, personal communication).

A random clinical survey conducted on 2035 residents of Bangalore city revealed that 19.2 and 2.95% of them were suffering respectively from rhinitis and bronchial asthma (Table 1). Skin tests performed on this study group revealed that 9.6%

and 4.3% of the total population respectively elicited positive skin reactions to Parthenium pollen and house dust. Among the patients suffering from rhinitis, 7.1% were sensitive to Parthenium pollen alone and an additional 1.3% elicited positive skin reaction to Parthenium and house dust mite, while 2.6% were sensitive only to house dust mite. Among patients with bronchial asthma, only 0.8 and 0.4% (of the total population) responded to house dust mite and extracts of Parthenium pollen respectively, when evaluated by skin prick test. However, 0.8 and 1.8% of the asymptomatics also elicited positive responses to both the allergen extracts and these results are in agreement with other reports (Hegy and Settipane, 1976; Barbee et al., 1976; Lindblad and Farr, 1961). Although, the presence of positive skin tests in non-allergic subjects may predict the onset of allergic symptoms (Hegy and Settpane, 1976), in the present study, the follow up of skin prick test positive non-symptomatic individuals for the onset of nasobronchial allergy was not attempted.

Studies performed on 1294 subjects suffering from nasobronchial allergy who visited our clinic between 1985 and 1988 revealed that 42.5% of them were sensitive to Parthenium pollen as evaluated by prick skin tests (Table 4). These studies further revealed that out of the 810 patients suffering from rhinitis, 307 (37.9%) were sensitive exclusively to Parthenium pollen, while an additional 124 (12.5%) with sensitivity to house dust mite and other inhalent allergens also elicited strong prick skin reaction to Parthenium pollen. The incidence of rhinitis among patients sensitive to Parthenium was highest

during the monsoon months (June-October) and corresponded with the maximal incidence of airborne Parthenium pollen during these months (Fig. 1.) (Rao et al., 1985; Mangala et al., 1981).

Varying amounts of allergen-specific IgE and/or IgG were present in the sera of Parthenium sensitive patients (Fig. 2). The specificity of these antibodies to Parthenium pollen allergens was established by ELISA inhibition assay (Fig. 7 and 8). Quantitation of Parthenium-specific IgE by the AB-microELISA revealed that only 61% of the skin test positive Parthenium sensitive patients had significant levels of allergen-specific IgE in their sera. Although, a high correlation (greater than 30%) between RAST, ELISA and skin tests has been reported (Ali and Ramanarayan, 1984; Negrini et al., 1983; Ali et al., 1980), several investigators recorded only 50-66% agreement for Parthenium, birch, ragweed, grass pollen and mould allergens (Rao, et al., 1985; Akiyama, et al., 1981; Perera et al., 1975 and Berg et al., 1971). A positive skin test without detectable levels of allergen-specific IgE was the discordant result most frequently encountered in these studies. The discordance of results obtained with Parthenium pollen allergens does not seem to be due to presence of irritant substances as only 1.8% of the asymptomatics elicited positive skin reaction to Parthenium pollen (Table 2). Further, the presence of blocking antibodies (IgG) at levels that might interfere with the quantitation of allergen-specific IgE by ELISA is unlikely as none of the patients included in the present study were undergoing hyposensitization for Parthenium. Since high titers of allergen-

specific IgG antibodies are known to compete with IgE for binding to the solid phase-bound allergen, it is possible that elevated levels of Parthenium-specific IgG found in the sera of 68% of the patients might be one of the reasons for the inability to detect Parthenium-specific IgE antibodies in the sera of patients with positive skin reaction to extracts of Parthenium pollen. This may not, however, be true since elevated levels of both Parthenium-specific IgE and IgG with a significant correlation between them ($r=0.55$; $p < 0.001$) were demonstable in the sera of a number of patients (Fig. 3). The other possibility for the negative ELISA results could be the presence of allergen-specific anaphylactic antibodies of IgG_4 subclass which are known to induce positive skin reactions (Vijay and Peralmultter, 1977; Stanworth and Smith, 1973). The presence of sensitized lymphocytes in the blood of Parthenium sensitive patients was demonstrable by lymphocyte transformation test (Fig. 9). Lymphocytes from Parthenium-sensitive patients were found to be stimulated in vitro by Parthenium allergens. Similar lymphoproliferative responses to purified allergens from other sources have been reported (Buckley et al., 1977; Gatien et al., 1975 and Evans et al.,1972).

The studies presented in this chapter establishes that Parthenium is one of the most potent allergens responsible for the highest incidence of allergenic rhinitis due to a single pollen. However, it does not seem to be significantly responsible for bronchial asthma. Based on clinical history and skin tests performed on individuals living in areas heavily

infested with Parthenium weed for the past 5 years, the rhinitis patients could be categorized into four groups, viz., (1) those who were not sensitive to common inhalent allergens (vasomotor rhinitis), (2) those sensitive to house dust mite and other allergens but not to Parthenium pollen, (3) those sensitive to Parthenium and one or more other inhalent allergens and (4) those who were exclusively sensitive to Parthenium pollen. The latter group constitutes the major group of individuals allergic to Parthenium. Thus Parthenium which was hitherto an unrecognized world-wide allergen, is now gaining importance as a potent allergen in disturbed sites. Further studies on the generation of reference extracts of Parthenium pollen for diagnosis and immunotherapy are needed.

SUMMARY

The air borne pollen of the South American weed, Parthenium hysterophorus (American feverfew), accidentally introduced into India was found to be responsible for severe allergic rhinitis. A random clinical survey conducted on 2035 residents of Bangalore city with the aid of questionnaires and skin test revealed that 7.1% of the study population was suffering from allergic rhinitis due to exposure to Parthenium pollen. Prick skin test performed on 1294 clinic patients suffering from nasobronchial allergy during the past 4 years has also shown that 42.5% of them were sensitive to Parthenium pollen. IgE and IgG antibodies specific for Parthenium pollen allergens were demonstrable in the sera of Parthenium sensitive rhinitis patients. The specificity of these antibodies to Parthenium allergens was established by ELISA

inhibition assay. A 7 to 11-fold higher stimulation was observed when lymphocytes from two Parthenium sensitive rhinitis patients were treated in vitro with Parthenium pollen extract. To our knowledge, no where in the world has such a high incidence of allergic rhinitis due to a single pollen ever been reported.

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